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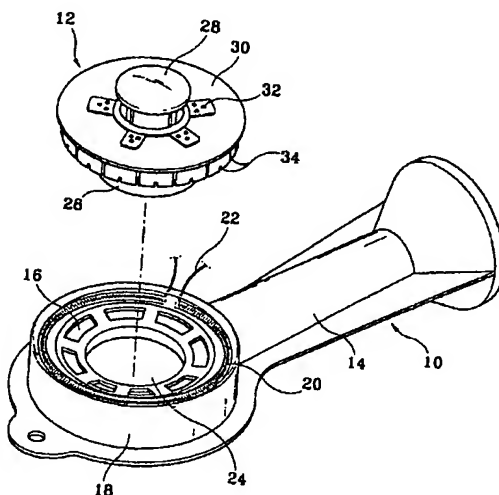
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- (71) Applicants and
(72) Inventors: KIM, Seong-Soo [KR/KR]; 107-1104 Mongyeon Town Apt. 716, Ilwon-dong, Kangnam-gu, Seoul 135-239 (KR). YOO, Myoung-Ok [KR/KR]; 107-1104 Mongyeon Town Apt. 716, Ilwon-dong, Kangnam-gu, Seoul 135-239 (KR).
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(54) Title: BURNER IGNITING APPARATUS AND METHOD OF GAS RANGE



(57) Abstract: In a burner of a gas range with a body formed with a gas discharge outlet along a circumferential direction, a cap coupled to an upper side of the body for radially dispersing the gas discharged from the gas discharge outlet and an opening and closing valve coupled to the body for opening and closing a passage of gas discharged through the gas discharge outlet, a burner igniting apparatus of a gas range comprises a heater having a heating wire mounted at the gas discharge outlet, a heat detecting sensor for detecting a heated state of the heating wire, and device for controllably opening and closing the opening and closing valve in response to a signal detected from the heat detecting sensor, whereby ignition failure can be avoided and amount of gas necessary for ignition can be reduced, thereby preventing safety hazard possibly resultant from gas discharge unignited and safeguarding a user's body.

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TITLE OF THE INVENTION

BURNER IGNITING APPARATUS AND METHOD OF GAS RANGE

FIELD AND PRIOR ART OF THE INVENTION

The present invention relates to a burner igniting apparatus and method
5 of gas range.

A gas range is generally a fire source for cooking food and its use is now
generalized. The gas range according to the prior art includes a body formed
thereon with a gas discharge outlet along a circumferential direction, a burner
part equipped at an upper side of the body with a cap for radially dispersing
10 gas coming out of the gas discharge outlet, and an igniting apparatus disposed
at a predetermined position of the gas discharge outlet and mounted with an
ignition plug for igniting the gas flowing along the body.

In the gas range thus described, when an ignition switch is turned on,
an arc is generated from the ignition plug to burn the gas, where the gas is not
15 ignited all at once but burnt sequentially from a place where the ignition plug is
located to a circumferential direction.

TECHNICAL SUBJECT TO BE ACCOMPLISHED

There is a problem in the gas range thus described according to the
prior art in that the gas is sequentially ignited from the ignition plug to the
20 circumferential direction, and ignition occurs at one point such that chances of
ignition often fails, and in order to reduce this kind of ignition failure, amount of
gas is inevitably increased.

There is another problem in that possibility of ignition failure is high due
to various reasons even though a large quantity of gas is consumed, such that

when an ignition switch is turned on again while the ignition fails, a large quantity of discharged gas gathers at the gas range to be ignited at a time, resulting in a sudden explosion and safety hazard.

There is still another problem in that a large quantity of gas is leaked while the gas is burnt from the ignition plug to the circumferential direction, there is still further problem in that, when a large quantity of unburnt gas abounds while the ignition is failed or the ignition is being progressed, a user about the gas range may be inflicted on with a fatal unhealthy hazard if the user inhales the unburnt gas such as Liquefied Petroleum Gas (LPG), Liquefied Natural Gas (LNG) or the like.

The present invention is disclosed to solve the aforementioned problems and it is an object of the present invention to provide a burner igniting apparatus and method of gas range adapted to be able prevent ignition failure of gas and to reduce an amount of gas needed for ignition.

It is another object of the present invention to provide a burner igniting apparatus and method of gas range adapted to prevent a safety hazard from occurring due to unignited leaked gas, thereby enabling to preserve a user's health.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is an exploded perspective view of a first embodiment for illustrating a burner part of a gas range according to the present invention;

Figure 2 is a longitudinal sectional view of a first embodiment for illustrating a heater of a burner igniting apparatus at a gas range according to the present invention;

Figure 3 is a longitudinal sectional view of a second embodiment for

illustrating a heater mounted at a burner igniting apparatus of a gas range according to the present invention;

Figure 4 is a longitudinal sectional view of a third embodiment for illustrating a heater mounted at a burner igniting apparatus of a gas range according to the present invention;

Figure 5 is a longitudinal sectional view of a fourth embodiment for illustrating a heater mounted at a burner igniting apparatus of a gas range according to the present invention;

Figure 6 is a body plan view of a fifth embodiment for illustrating a heater installed at a burner igniting apparatus of a gas range according to the present invention;

Figure 7 is a longitudinal sectional view for illustrating how a cap is mounted;

Figure 8 is a control block diagram for illustrating a burner igniting method of a gas range according to the present invention;

Figure 9 is a flow chart for illustrating a burner igniting method of a gas range according to the present invention;

Figure 10a and 10b are flow chart for illustrating an embodiment added with an extinguishing step to a burner igniting method of a gas range according to the present invention; and

Figure 11 is an exploded perspective view for illustrating a sixth embodiment of a burner part of a gas range according to the present invention.

STRUCTURE AND OPERATION OF THE INVENTION

In a burner of a gas range comprising a body formed with a gas discharge outlet along a circumferential direction, a cap coupled to an upper side of the body for radially dispersing the gas discharged from the gas discharge outlet and an opening and closing valve coupled to the body for

opening and closing a passage of gas discharged through the gas discharge outlet, a burner igniting apparatus of a gas range according to the present invention includes a heater having a heating wire mounted at the gas discharge outlet, a heat detecting sensor for detecting a heated state of the heating wire, and control means for controllably opening and closing the opening and closing valve in response to a signal detected from the heat detecting sensor whereas the heating wire is continuously mounted along a circumferential direction at a lateral side of the discharge outlet.

The heating wire can be of a coiled shape or a halogen pipe intrinsically installed therein with a filament. The heating wire at the heater is disposed with a long groove and is supported by a ring-shape support member inserted into the body.

It is preferable that the body is further installed with a flame detecting sensor for detecting a gas flame ignited by the heater. The control means is also advised to have an opening and closing valve driving unit for driving the opening and closing valve, a control unit for controlling the valve driving unit in response to signals coming from the heat detecting sensor and the flame detecting sensor and a display unit for displaying controlled state of the control unit.

A burner igniting method of gas range according to the present invention comprises the steps of:

- establishing a heating temperature of a heater;
- operating the heater in response to manipulation of a manipulating switch;
- detecting a heating temperature by way of a heat detecting sensor in response to operation of the heater;
- determining whether the heating temperature has arrived at a pre-established heating temperature according to the detection at the heating

temperature detecting step (first determining step);

opening an opening and closing valve according to the determined result at the first determining step;

detecting flames generated by gas ignited by the heater, the gas being effused in response to opening of the valve at the valve opening step;

determining whether the flames have been detected at the flame detecting step (second determining step); and

blocking a power source of the heater in response to the determination at the second determining step.

10 The burner igniting method of a gas range, following the power shut-off step further comprises the steps of:

detecting whether gas flames have been extinguished by external environmental changes while combustion is being continued after the power source is blocked;

15 determining whether the gas flames are extinguished and being continued at the flame extinguishments detecting step (third determining step);

shutting off the opening and closing valve if the flames are extinguished according to the determination at the third determining step;

determining whether the manipulating switch has been turned off if the flames are being maintained according to the determining at the third determining step (fourth determining step); and

20 closing the opening and closing valve according to the determining at the fourth determining step.

At this time, the establishing step may further comprises the step of establishing a shut-off time of heater and the method following the fourth determining step further comprises the steps of:

operating the heater automatically according to determination at fourth

determining step;

closing the opening and closing valve following operation of the heater;

determining whether a pre-established shut-off time has lapsed following the closure of the opening and closing valve (fifth determining step);

5 and

shutting off the power source of heater according to the determining at the fifth determining step.

Now, preferred embodiments will be described in detail with reference to the accompanying drawings.

10 Figure 1 is an exploded perspective view of a first embodiment for illustrating a burner part of gas range according to the present invention while Figure 2 is a longitudinal sectional view for illustrating a heater of a burner igniting apparatus at a gas range according to the present invention.

As illustrated in Figures 1 and 2, the burner of a gas range includes a
15 body 10, and a cap 12 disposed on the body 10.

The body 10 is comprised of a pipe part 14 formed with a gas passage, and a receiving part 18 formed thereon with a gas discharge outlet 16 along a circumferential direction for receiving the cap 12. The receiving part 18 is arranged therein with a ring-shaped heating wire 20, being tangent to the gas
20 discharge outlet 16. The heating wire 20 is connected to a manipulating switch (not shown) by way of a wire 22 to form a heater (described later).

Furthermore, the gas discharge outlet 16 is coupled to a heat detecting sensor (not shown) for detecting a heated temperature of the heating wire while the body 10 is coupled at a side thereof with a flame detecting sensor (not
25 shown) for detecting the ignited and burning flame. The pipe part 14 at the

body 10 is formed with an opening/closing valve (not shown) for allowing the gas flowing through a pipe to pass or to be blocked off. The heat detecting sensor and the flame detecting sensor are connected to control means for receiving signals therefrom to controllably open and close the opening and
5 closing valve.

The receiving part 18 of the body is formed at a midsection thereof with a receiver 24 for accommodating a lower protruder of the cap 12. The gas discharge outlet 16 is discontinuously formed with a plurality of holes along a circumferential direction but can be formed with a continuous hole.

10 The cap 12 serves to radially disperse the gas effused from the gas discharge outlet 16 and is divided by a mid diaphragm 30 into a lower protruder 26 and an upper protruder 28. The lower protruder 26 is inserted into the receiver 24 of the receiving part while the mid diaphragm 30 is formed with a plurality of holes 32 communicating with the gas discharge outlet 16. The
15 diaphragm 30 is circumferentially formed with a plurality of holes 34 for guiding the gas radially coming out of the gas discharge outlet 16.

The heating wire 20 is circumferentially and continuously formed at a lateral surface of the gas discharge outlet 16 and is supported by a ring-shaped support member 41 inserted into the receiving part 18 with a long groove
20 receiving same. The heating wire 20 is a coiled nichrome wire while the support member 41 is made of ceramics.

At both marginal tips of the receiving part 18 at the body 10, there are formed bent jaws 40, each bent in a hook shape to a near vertical direction, to thereby prevent the support member 41 from being bolted away.

25 According to the burner igniting apparatus thus described, gas is

ignited on the heating wire installed along the entire lateral surface of the gas discharge outlet, such that there is no problem of ignition failure and gas is easily ignited even though gas flow is small during ignition. There is no gas leakage during ignition, thereby preventing safety hazard.

5 Figures 3 and 4 feature bent jaws 42 and 44, each horizontally bent at both sides thereof for horizontally holding each support member 43 and 45.

 As illustrated in Figures 2, 3 and 4, an installed position of the heating wire 20 varies according to formed directions of the bent jaws 40, 42 and 44 and position of the along groove 36 whereby an installed place of the heating
10 wire may be variably designed in consideration of various elements such as flowing direction of gas and the like. At this time, it should be noted that structure may be variably designed to change the position of the heating wire.

 Meanwhile, as illustrated in Figure 5, the heating wire 20 of the present invention may be installed at a circumference to ignite the gas even at a burner
15 of a gas range where gas comes into the middle of a body 10' to be dispersed to both sides of a cap 12'.

 As illustrated, long groove of the support member 48 may be structure to be formed with a plurality of protruders 47 to hold the heating wire 20.

 Figure 6 is body plan view of a fifth embodiment for illustrating a heater
20 mounted at a burner igniting apparatus of a gas range according to the present invention, where a heating wire 20' according to the present embodiment is situated at both sides of a gas discharge outlet 16' in a continuous state. This structure, as illustrated in Figure 7, is formed with a support member 49 for supporting the heating wire 20', even at an inner side of the gas discharge
25 outlet 16' where the support member 49 is hitched by a bent jaw 48. Most of

the gas coming out through the gas discharge outlets 16 and 16' are ignited to be diffused toward the margin of the cap 12 but some portion of the gas are ignited to be discharged through a hole 32 at a diaphragm 30. The heating wire is not limited to an installation example of the present embodiment but may be
5 variably designed.

Figure 11 is an exploded perspective view for illustrating a sixth embodiment of a burner part of a gas range according to the present invention, where a heating wire is a halogen pipe 120 formed therein with a filament.

The halogen pipe 120 having a diameter of approximately 5mm is filled
10 therein with halogen gas and is arranged therein with a filament. The halogen pipe is formed at both ends thereof with terminals each connected to an electric wire 22.

In general, the halogen pipe 120 is a quartz pipe and the filament mounted therein is a tungsten filament. The halogen gas is a composite
15 material belonging to elements of halogen family including fluoro, chlorine, bromine, iodine, astatine. A heater having a halogen pipe 120 thus described is abruptly heated when a manipulating switch is turned on to minimize a heating time and prolong life thereof.

Other structural elements of the sixth embodiment in Figure 11 are
20 identical as those of Figure 1 such that explanation thereto is omitted.

The burner igniting apparatus of a gas range thus constructed according to the present invention either receives a signal from the heat detecting sensor to control the opening/closing valve, or receives signals from the heat detecting sensor and flame detecting sensor to control the
25 opening/closing valve, where Figure 8 illustrates a block diagram where signals

are received from the heat detecting sensor and the flame detecting sensor to control the opening/closing valve.

As depicted in the drawing, the heat detecting sensor 50 for detecting the heated state of the heating wire and the flame detecting sensor 60 for detecting the state where gas is ignited to be burnt are connected to a control unit 70 for receiving the signals therefrom and outputting a control signal. The control unit 70 is connected to a display unit 80 for displaying manipulated state (ignition switch on, off and the like). The control unit 70 is also connected to a warning sound generating unit 90 for generating a warning sound or the like when the signal is not detected within a predetermined established period of time due to malfunction at the heat detecting sensor and the flame detecting sensor, or discrepancy at the opening/closing valve.

Furthermore, the control unit 70 is connected to an opening/closing valve driving unit 100 which in turn is connected to an opening/closing valve 110 for being driven by the signal. The control unit 70 is further connected to a heater switch 120 which is again connected to a heater 130 operated by manipulation of a manually operated switch or signal from the control unit 70.

Next, flow chart of Figure 9 will be described in detail with regard to igniting method by the burner igniting apparatus of a gas range according to the present invention.

In the present embodiment, display step for displaying manipulated state (ignition switch on, off or the like) and warning sound generating step for warning by way of sound or the like when a signal is not detected within a predetermined established period of time due to malfunction of heat detecting sensor and flame detecting sensor or discrepancy of the opening/closing valve are not illustrated but can be further added if ever needed.

First of all, a heating temperature is set up for detecting when the opening/closing valve is to be opened at which temperature of the heating wire, step S200 and heater is operated by manipulation of the manipulating switch, step S210.

- 5 Successively, heating temperature of the heater is detected by the heat detecting sensor, step S220, and the control unit determination step S230 whether the heating temperature has reached an established temperature at step S200.

- 10 As a result of the determination at step S230, if the heating temperature has reached the established temperature, the opening/closing valve is opened by way of the opening/closing driving unit, step S240. At this time, if the heating temperature has not reached the predetermined established temperature at step S230, flow returns to step S220.

- 15 Successively, a state where the gas effused through the gas discharge outlet is ignited by the heater is detected by the flame detecting sensor, step S250, while the control unit determines whether the flame has been detected, and if the flame has been detected, a heater power source is cut off, step S270 to terminate the process and if the flame has not been detected, flow returns to step S250.

- 20 According to the igniting method thus described, there is no fear of ignition failure because the heater is first operated to heat the heating wire and the opening/closing valve is opened to release the gas at an appropriate temperature, such that when the ignition is realized, an electric power to the heater is cut off, thereby preventing damage resultant from over-heat of the
25 heater.

Figures 10a and 10b are flow chart for illustrating an embodiment added with an extinguishing step to a burner igniting method of a gas range according to the present invention.

In the present embodiment, steps upto the step S270 for cutting off the electric power to the heater after ignition is the same as in Figure 9 such that
5 explanation thereto is omitted. Furthermore, although extinguishing step may be explained by way of closing the opening/closing valve in response to manipulation of the manipulating switch when flame is not extinguished and shutting off the opening/closing valve when the flame is extinguished following
10 electric power to the heater being cut off and flame extinguishments being detected, another extinguishing step will be explained where the heater is re-activated during extinguishments to completely burn the gas remaining in between the opening/closing valve and the gas discharge outlet.

As illustrated in the drawing, an electric power source to the heater is
15 shut off, step S270, and determination is made by the flame detecting sensor as to whether there is still flame, step S300, so as to ascertain whether gas flame has been put out by way of external environmental change while the burning is still going on, while the control unit determines whether flame has been extinguished in response to a signal from the flame detecting sensor, step
20 S310.

As a result of determination as to whether or not there is still flame, if the flame has been extinguished, the opening/closing valve driving unit is driven to shut off the opening/closing valve, step S320, to terminate the process. As a result of determination, if the flame is still maintained, determination is made
25 as to whether or not the manipulating switch has been turned on or turned off, step S330, and if the manipulating switch has been turned off, a heater switch is turned on to activate the heater, step S340 and the opening/closing valve

driving unit is driven to shut off the opening/closing valve, step S350.

If the manipulating switch has not been turned off, flow returns to step S310. A determination is made as to whether a predetermined period of time (by way of example, 10 seconds) has lapsed following the closure of the opening/closing valve step S360 and if the predetermined period of time has
5 passed, the electric power source to the heater is shut off, step S370 to terminate the process. The predetermined period of time is priorly established at an initial set-up step.

According to the method thus described, the power source to the
10 heater is shut off following closure of the opening/closing valve after the heater is re-activated during extinguishments, such that the gas remaining between the opening/closing valve and the gas discharge outlet is completely burnt.

As apparent from the foregoing, there is an advantage in the burner
15 igniting apparatus and method of gas range thus described according to the present invention in that ignition failure can be avoided whereby amount of gas necessary for ignition can be reduced, thereby preventing safety hazard possibly resultant from gas discharge unignited and safeguarding a user's body.

WHAT IS CLAIMED IS:

1. In a burner of a gas range with a body formed with a gas discharge outlet along a circumferential direction, a cap coupled to an upper side of the body for radially dispersing the gas discharged from the gas discharge outlet and an opening and closing valve coupled to the body for opening and closing a passage of gas discharged through the gas discharge outlet, a burner igniting apparatus of a gas range comprises a heater having a heating wire mounted at the gas discharge outlet, a heat detecting sensor for detecting a heated state of the heating wire, and control means for controllably opening and closing the opening and closing valve in response to a signal detected from the heat detecting sensor whereas the heating wire is continuously mounted along a circumferential direction at a lateral side of the discharge outlet.
2. The apparatus as defined in claim 1, wherein the heating wire is a nichrome wire.
3. The apparatus as defined in claim 1, wherein the heating wire is a halogen pipe intrincally installed therein with a filament.
4. The apparatus as defined in claim 1, wherein the heating wire at the heater is disposed with a long groove and is supported by a ring-shaped support member inserted into the body.
5. The apparatus as defined in one of 1-4 claims, wherein the body is further installed with a flame detecting sensor for detecting a gas flame ignited by the heater, and the control means includes an opening and closing valve driving unit for driving the opening and closing valve, a control unit for controlling the valve driving unit in response to signals coming from the heat detecting sensor and the flame detecting sensor and a display unit for displaying controlled state of

the control unit.

6. A burner igniting method of gas range, the method comprises the steps of:

establishing a heating temperature of a heater;

operating the heater in response to manipulation of a manipulating
5 switch;

detecting a heating temperature by way of a heat detecting sensor in
response to operation of the heater;

determining whether the heating temperature has arrived at a pre-
established heating temperature according to the detection at the heating
10 temperature detecting step (first determining step);

opening an opening and closing valve according to the determined result
at the first determining step;

detecting flames generated by gas ignited by the heater, the gas being
effused in response to opening of the valve at the valve opening step;

15 determining whether the flames have been detected at the flame
detecting step (second determining step); and

blocking a power source of the heater in response to the determination
at the second determining step.

7. The method as defined in claim 6, following the power shut-off step, further
20 comprising the steps of:

detecting whether gas flames have been extinguished by external
environmental changes while combustion is being continued after the power
source is blocked;

determining whether the gas flames are extinguished or being continued
25 at the flame extinguishments detecting step (third determining step);

shutting off the opening and closing valve if the flames are extinguished
according to the determination at the third determining step;

determining whether the manipulating switch has been turned off if the flames are being maintained according to the determination at the third determining step (fourth determining step); and

5 closing the opening and closing valve according to the determination at the fourth determining step.

8. The method as defined in claim 7, wherein the establishing step further comprise the step of establishing a shut-off time of heater and the method following the fourth determining step further comprises the steps of:

10 operating the heater automatically according to determination at fourth determining step;

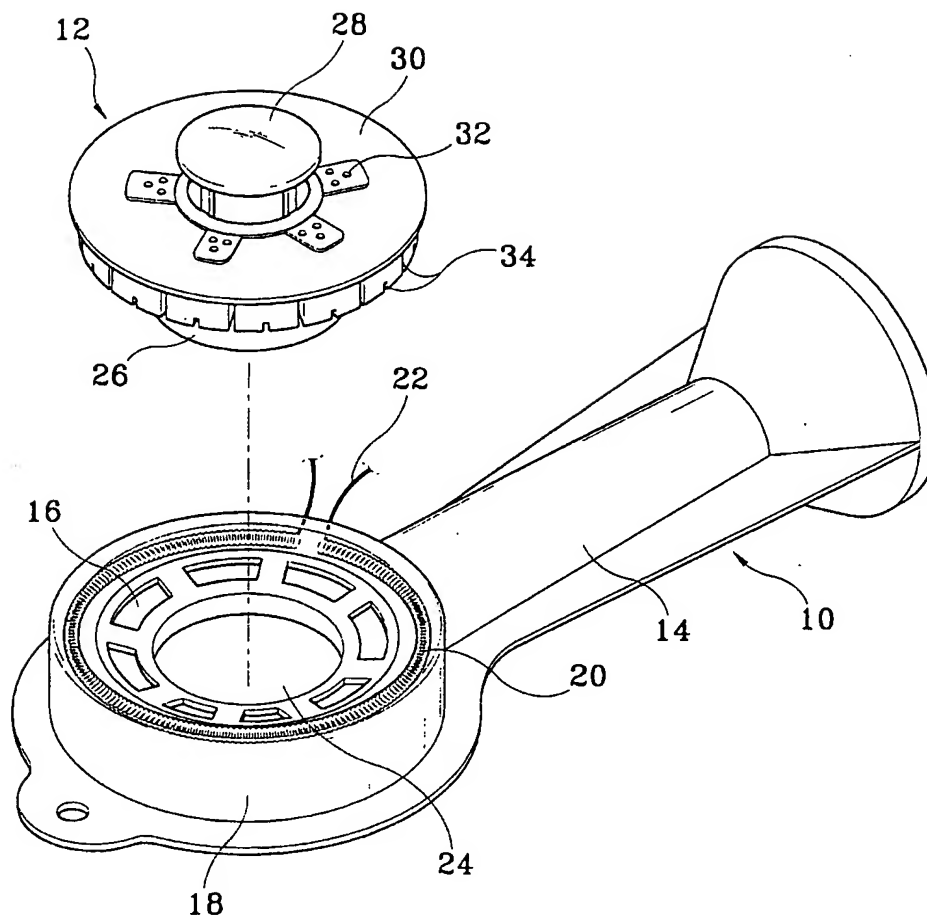
closing the opening and closing valve following operation of the heater;

determining whether a pre-established shut-off time has lapsed following the closure of the opening and closing valve (fifth determining step); and

15 shutting off the power source of heater according to the determination at the fifth determining step.

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FIG. 1



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FIG.2

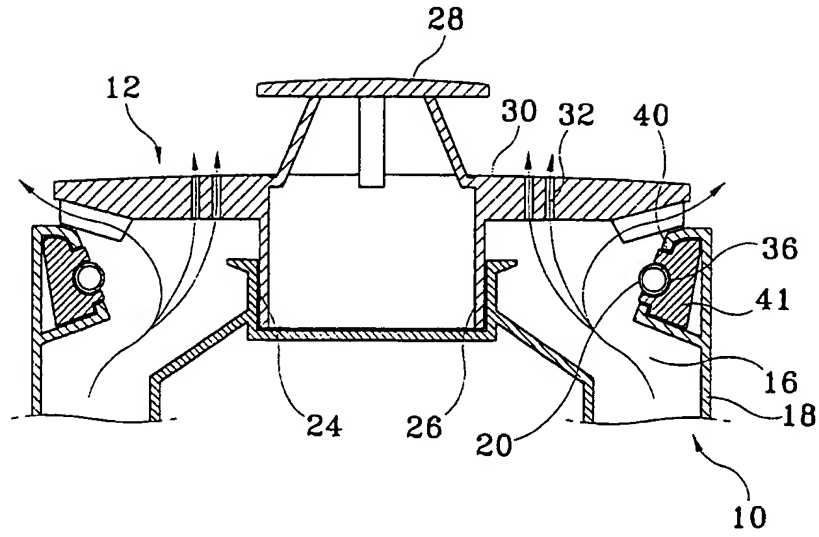
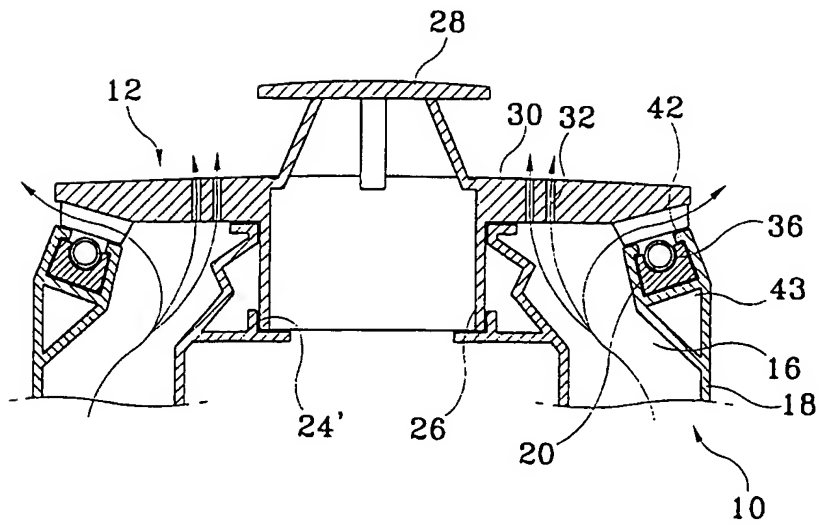


FIG.3



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FIG.4

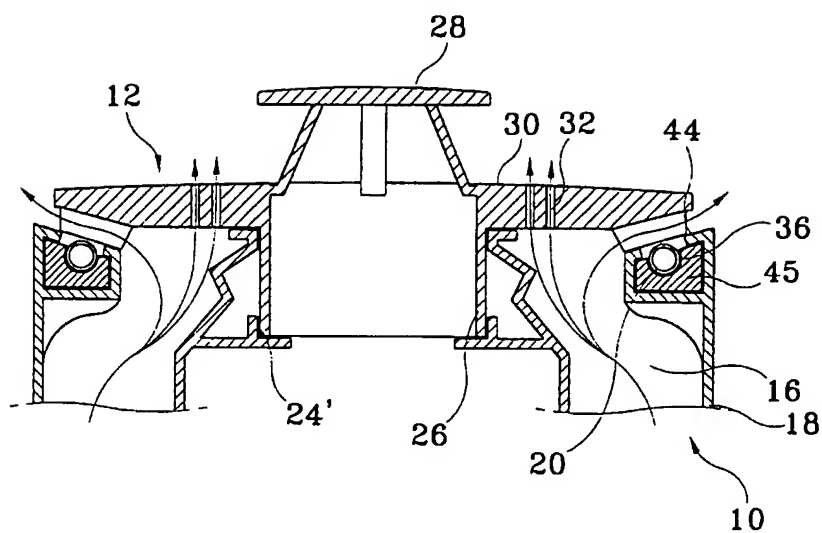
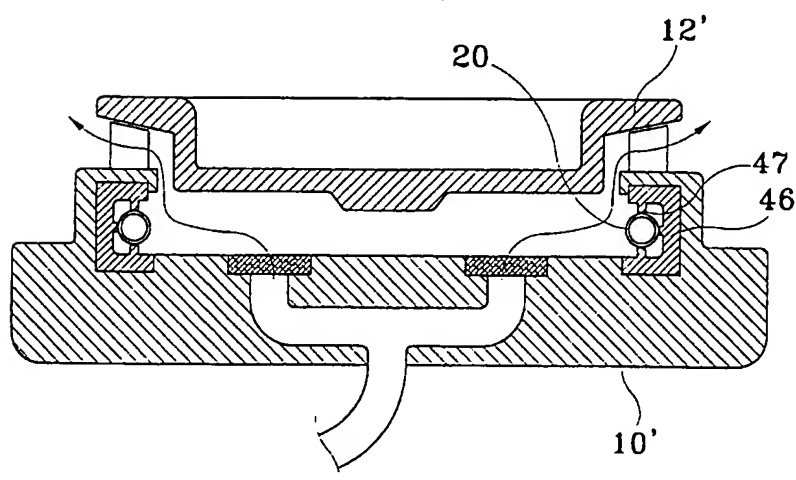


FIG.5



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FIG.6

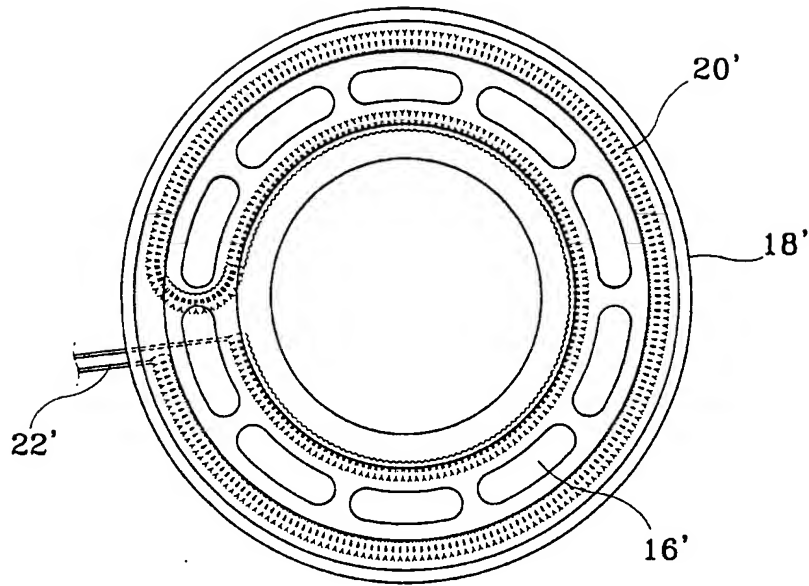
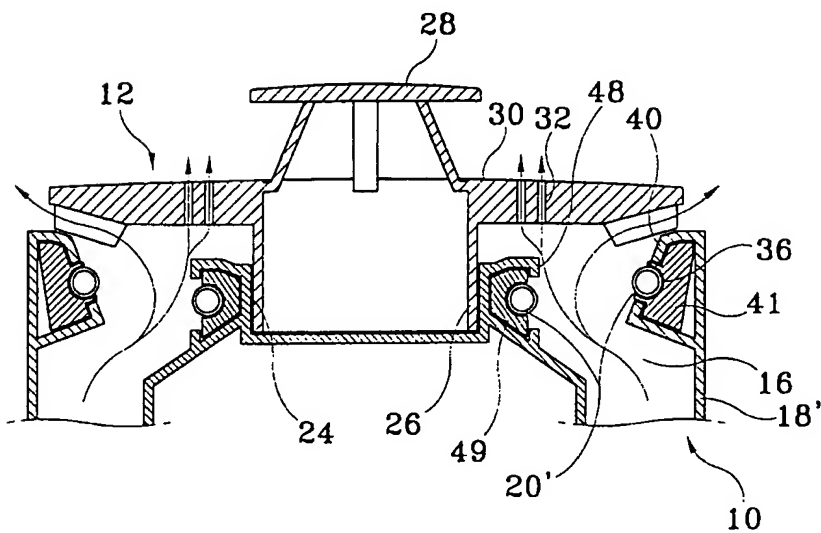
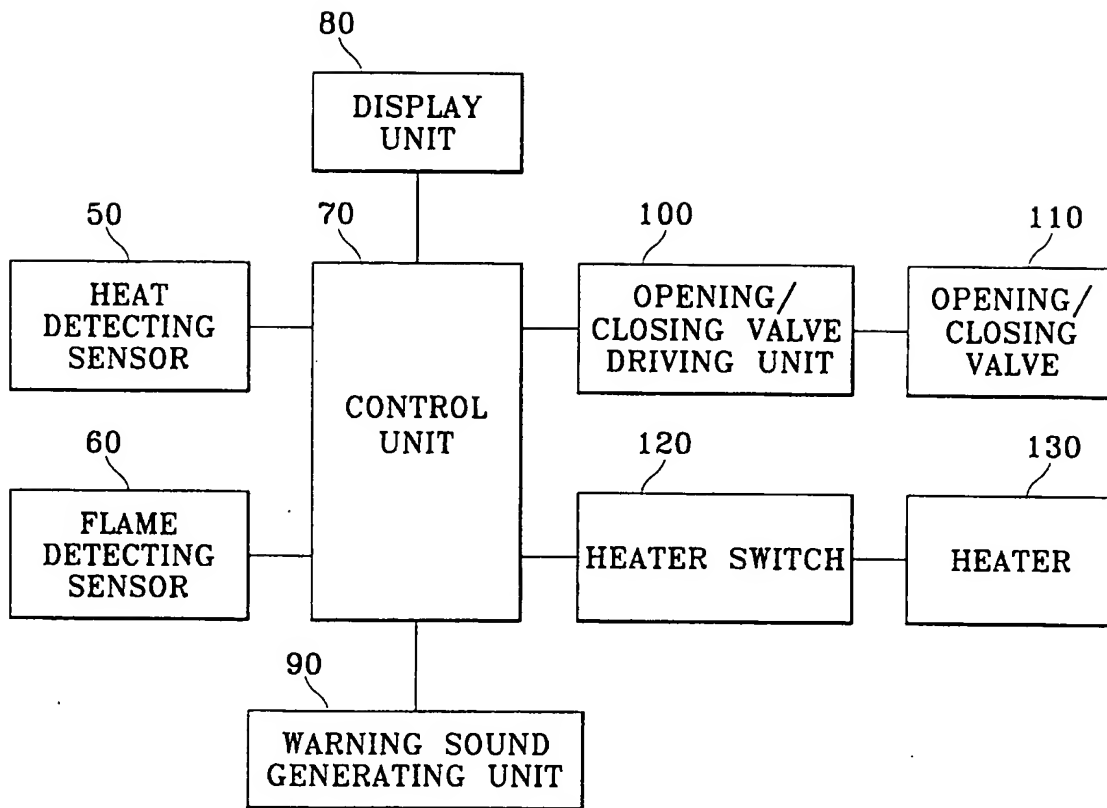


FIG.7



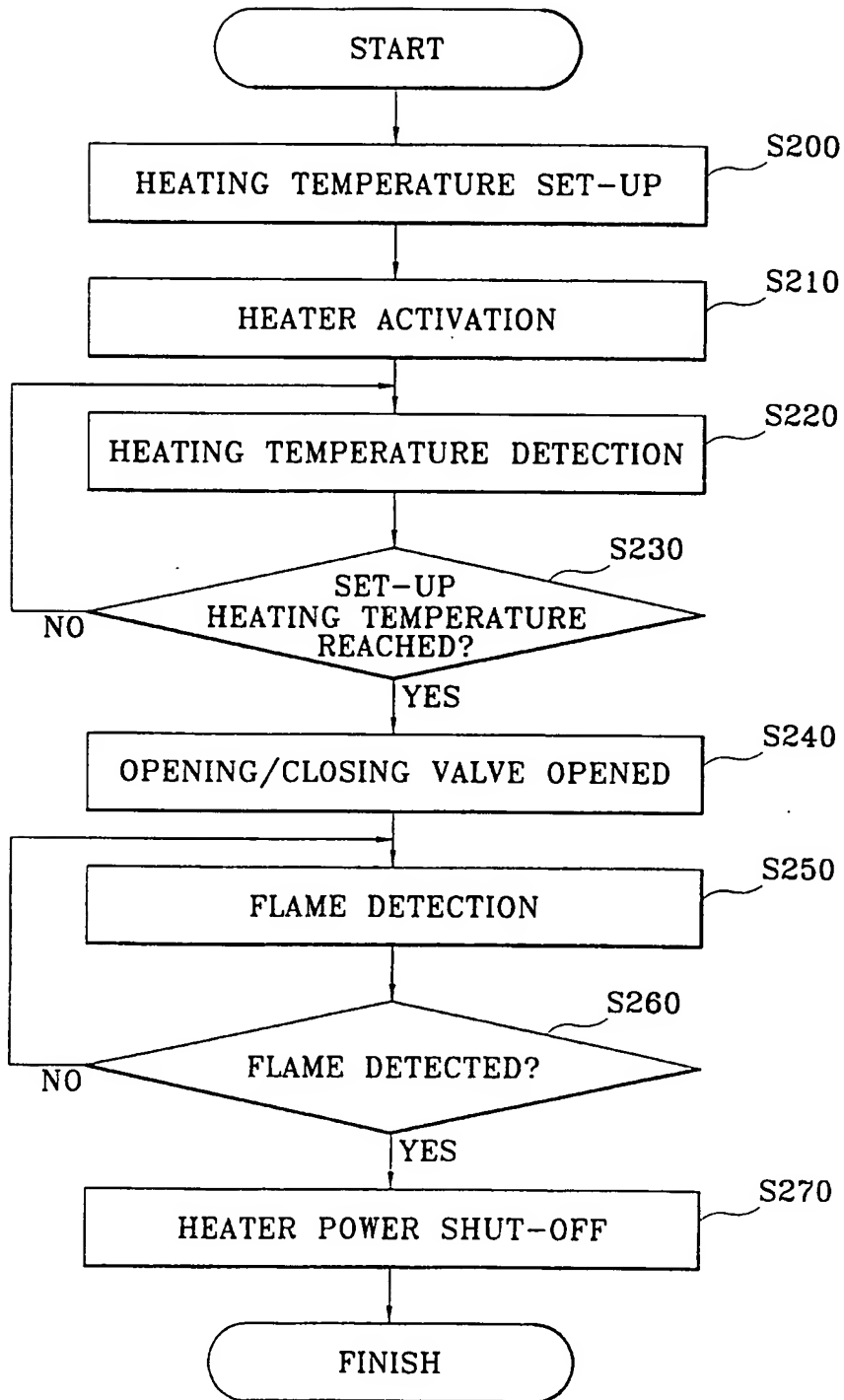
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FIG.8



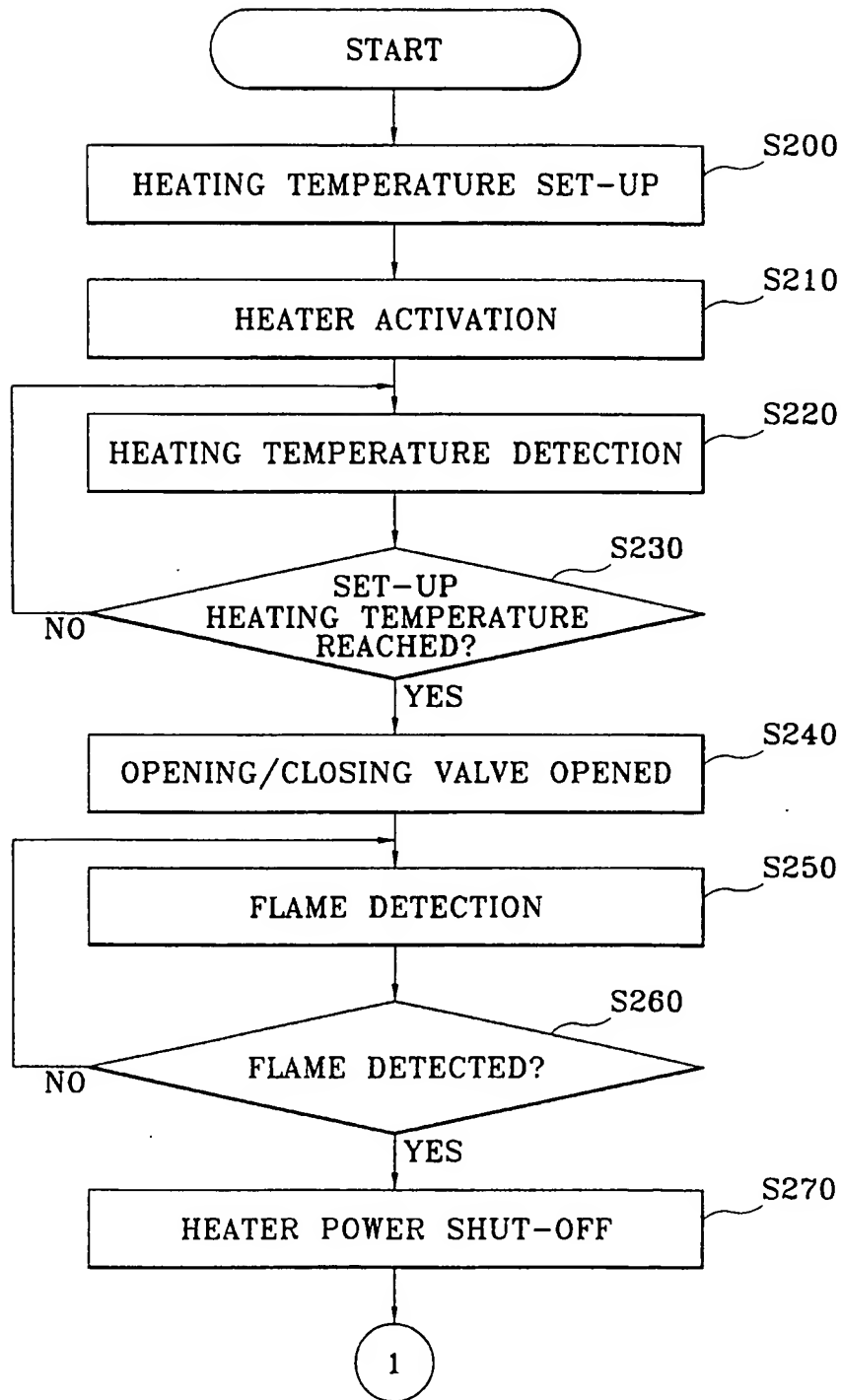
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FIG.9



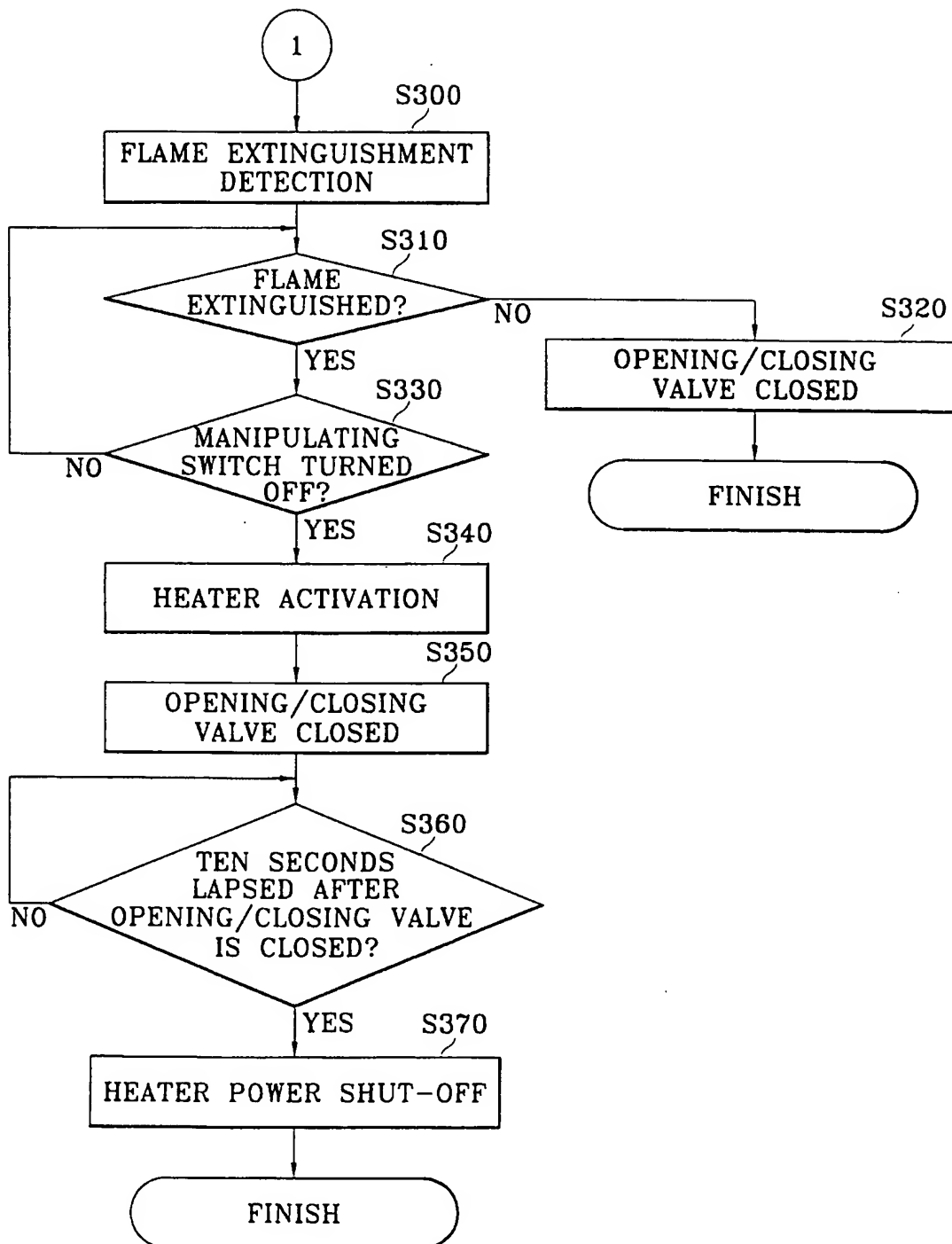
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FIG.10a



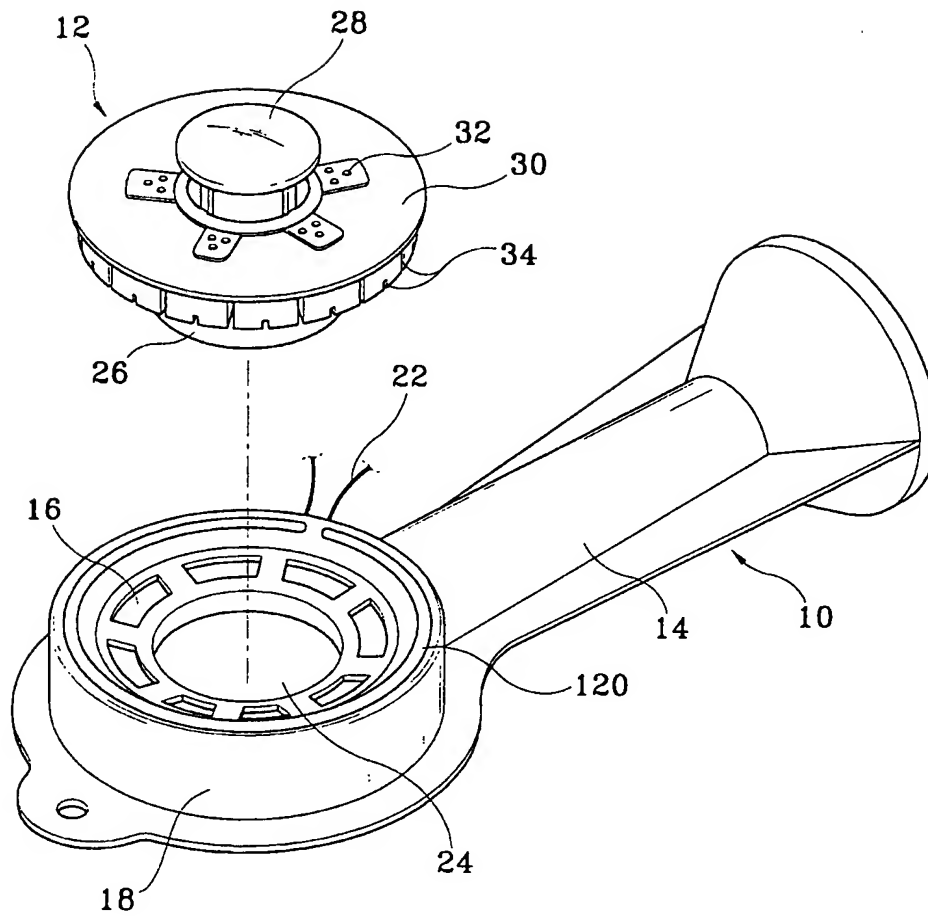
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FIG.10b



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FIG. 11



INTERNATIONAL SEARCH REPORT

 International application No.
 PCT/KR01/00482
A. CLASSIFICATION OF SUBJECT MATTER**IPC7 F24C 3/10**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 F24C 3/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR,JP:IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NPS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,035,136 A(Howatt et al.) July 12, 1977 see column 2.line 13 - column 2.line 47	1 - 8
A	US 4,626,196 A(Stohrer, Jr.) Dec. 2, 1986 see column 6.line 4 - column 6.line 55	1 - 8
A	US 3,874,841 A(Ferlin) Apr. 1, 1975 see the whole document	1 - 8
A	US3,938,944 A(Riehl.) Feb.17, 1976 see column 4.line 58 - column 5.line 41	1 - 5



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

18 JULY 2001 (18.07.2001)

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Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, Dunsan-dong, Seo-gu, Daejeon
Metropolitan City 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE, Sung Cheol

Telephone No. 82-42-481-5478

